Control device for controlling electromedical appliances

DESCRIPTION

The invention relates to a control device for controlling electromedical appliances or groups of such appliances.

In order to control electromedical appliances, such as HF generators, laser equipment, surgical instruments employing water jets or similar apparatus used in particular in an operating theater, it is necessary for switching means to be employed, in particular by the surgeon, to control the function of the attached appliances or groups thereof according to the momentary requirements. For example, to stop bleeding an APC (argon-plasma coagulation) instrument is used, in which case actuation of a pedal switch on one hand opens a valve in order to deliver argon to a probe (and thus to the treatment site) and on the other hand to drive an HF generator in such a way that a high-frequency current flows from an electrode in the probe to the tissue while ionizing the argon, so that the tissue is coagulated. With the same device another function can also be performed, for which purpose the HF generator is switched into another mode of operation. All these control functions can be initiated with one switch, but usually several switches, which are often designed to be pressed by hand or foot. When several such push-buttons or pedals are needed to control one or more appliances or groups thereof, each of these closed systems is connected to the associated appliances or groups thereof by means of a cable. Cable-free connections are also known, but even for these a special transmission pathway

is assigned to each switching device. If it is desired for another function to be activatable at an appliance or group thereof, the appropriate switching means to support the function now desired must be newly installed, or another switching means must be appropriately altered and its connections rearranged. This is a complicated process.

Furthermore, in some circumstances a large number of cable connections are needed, and this situation causes a considerable disturbance of the surgical procedures being carried out in the foreground, owing to both mechanical interference ("stumbling" over the cables) and electromagnetic interference caused by the many cables and control leads together acting as antennae. The alternative of replacing the many cables by many radio links in turn causes a large number of electromagnetic disturbances.

It is the objective of the invention to develop a control device of the kind described above further in such a way as to increase its versatility while keeping the structure compact, with little possibility of disturbances.

This objective is achieved by a control device for controlling electromedical appliances or groups thereof that comprises at least two pedal switches or similar switching means to generate control signals for controlling the appliances or groups thereof, connecting means for connecting the switching means to one another, allocation means for allocating to the control signals particular controlling functions with respect to the appliances or groups thereof, and information-transfer means to transmit the control signals from the switching means to the appliances or groups thereof.

A substantial point of the invention resides in the fact that the switching means are no longer directly connected (and this includes even wireless connection of whatever kind) to the appliances or groups thereof, but rather the switching means

are indirectly connected thereto by way of the allocation means, so that within the latter a particular control function, designed for particular functions of the appliances or groups thereof, can be allocated to each switching means. In this way the informational content, so to speak, of the signals produced by the switching means can be changed without altering the switching means themselves. This makes it possible not only to change the function of already installed control devices, but also to couple to one another as many control devices as desired, producing what amounts to a "keyboard", in which the "significance of the keys" can be determined by the operator according to what is required.

The connecting means comprise a data bus designed so that after a plurality of switching means have been connected to one another, the control signals of all switching means are available at the data bus. This ensures in a simple manner that all signals from the switching means are made available simultaneously.

Each of the switching means in this case comprises two signal couplers, in particular plug-and-socket connectors, connected to the data bus in such a way that when several switching means are connected to one another in series, at least one of the signal couplers can be used to connect the data bus to the information-transfer means. As a result, an unlimited number of switching means can be plugged together to form a "keyboard".

The information-transfer means can be connected to the appliances or groups thereof by way of a lead. Alternatively it is possible to equip the information-transfer means with at least one transmitter that can be connected to the switching means, and to provide at least one receiver connected to the appliances or groups thereof, for wireless transmission of the control signals. This eliminates the risk of "stumbling" over wires.

As described above, the switching means can be connected directly to one another. In the case of mechanical connection, a base plate can be provided onto which the switching means are set. Alternatively it is possible to equip the base plate with intermediate connection means, by way of which the switching means can be connected to one another. Within this base plate, furthermore, the transmitter and/or power supply or the like can be disposed. Preferably coding means are provided so that switching means can be identified by the appliances or groups thereof, so that the appliances can recognize "by themselves" the switching means allocated to them, and malfunctions or incorrect combinations can be ruled out.

In the following the invention is explained in greater detail with reference to exemplary embodiments, as follows:

Fig. 1 shows a group of pedal switches separated from one another;

Fig. 2 shows the group of switches according to Fig. 1 when they have been plugged together;

Fig. 3 shows a group of pedal switches with a base plate,

Fig. 4 shows a group of pedal switches with wireless connection and

Fig. 5 is a schematic block diagram of one embodiment of the control device in accordance with the invention.

In the following description, the same reference numerals are used for identical parts or parts with identical actions.

As is evident in Fig. 1, a group of pedal switches 10 is provided, each of which comprises a multi-pole connecting means 20 and (on the opposite side of the housing, not shown) a corresponding connecting means, so that the switching means 10

shown here as pedal switches can be plugged together to form a group, as is shown in Fig. 2. In addition mechanical connections are provided so that the group shown in Fig. 2, which comprises a total of four pedal switches, is firmly interconnected mechanically and so can be manipulated as a unit. For connection to the appliances that are to be controlled, which are described in greater detail below, a cable is provided to serve as information-transfer means 40.

The embodiment shown in Fig. 3 differs from that according to Fig. 2 in that the pedal switches 10 are connected to one another not directly but indirectly, by way of associated plug connectors 11 in a base plate 50 that serves simultaneously as a pedestal for the group of pedal switches. Here, again, the connection to the appliances that are to be controlled is brought about by a cable 40.

The embodiment shown in Fig. 4 differs from that according to Figs. 1 and 2 in that instead of a cable, the information-transfer means 40 is designed as a wireless transmitter, i.e. one that transmits by radio or infrared signals. Within these transmission means a rechargeable power source is also provided, so that the whole unit can easily be transported and set up at any desired sites, with no need for a cable to be attached. This embodiment, of course, can also be combined with that according to Fig. 3. In particular, for example, the wireless information-transfer means can be disposed within the base plate 50.

In Fig. 5 the electrical structure of the whole arrangement is shown in principle in a block diagram. It can be seen in this diagram that each of the switching means 10 comprises plug-and-socket connectors 11 and 12, which are correspondingly shaped so that an arbitrarily large number of switching means 10 can be arrayed side by side and electrically connected to one another. The information-transfer means 40 can then be plugged into the last (on the left, in Fig. 5) switching means 10.

One of the items provided in each of the switching means 10 is a data bus 21, which on one hand accepts the information arriving at the plug-and-socket connector 12 from another plugged-in switching means 10 and passes it on to the plug-and-socket connector 11 (and ultimately to the information-transfer means 40), and on the other hand is connected to a signal-generating means 13 so that by way of a switch 14, e.g. a pedal such as is shown in Figs. 1-4, switch signals are generated and sent on to the plug-and-socket connector 11. At the switching means 10 there are additionally provided allocation means 30, e.g. in the form of coding switches, by way of which particular functions can be assigned to the various switching means 10, with reference to appliances 1, 1' or appliance groups 2, which are to be controlled by way of the switching means 10.

The items of information transferred within the data bus 21 are conducted through the connectors 11 and 12 to a transmitter 41, the signals from which are received by a receiver 42, which together with the transmitter 41 constitutes the information-transfer means 40. It should be pointed out that instead of a wireless transmission of this kind, a cable can be used.

The above-mentioned allocation means 30 can also be disposed within the receiver 42, so that for each switching means 10 the "content" of an item of switching information it has generated can also be sent on to a central site.

In addition, there is provided in the receiver 42 a coding means 43 designed so that the signals sent from the receiver 42 through the connecting cable 44 to the appliances 1, 1' or appliance groups 2 can carry out only the control functions that are permitted in those particular appliances or appliance groups. It is likewise possible to use such coding in order to block certain combinations of functions, so that for instance it is impossible during an operation for a given appliance to be used simultaneously for rinsing and for conducting high-frequency current, since such current should be switched on

only in combination with the delivery of an inert gas, when no rinsing fluid is present. By this means, therefore, it is simultaneously possible to eliminate malfunction owing to errors made by the person operating the switching means 10.

It will be evident from the above that an essential point of the present invention resides in the fact that the switching means 10 are initially not specified for particular functions, and the allocation of functions (including protection against malfunctions) is brought about by the allocation means 30 and the coding means 43 (centrally or at each switching means 10).

List of reference numerals

1,1'	Appliance
2	Group of appliances
10	Switching means
11	Plug-and-socket connector
12	Plug-and-socket connector
13	Signal-generating means
14	Switch
20	Connecting means
21	Data bus
30	Allocation means
40	Information-transfer means
41	Transmitter
42	Receiver
43	Coding means
44	Connection cable
50	Base plate